

## ALASKA NON-NATIVE PLANT INVASIVENESS RANKING FORM

*Botanical name:*            *Hordeum vulgare* L.

*Common name:*            common barley

**Assessors:**

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*Date:* 3/2/2011

*Date of previous ranking, if any:* 4T

**OUTCOME SCORE:**

**CLIMATIC COMPARISON**

*This species is present or may potentially establish in the following eco-geographic regions:*

Pacific Maritime	<u>Yes</u>
Interior-Boreal	<u>Yes</u>
Arctic-Alpine	<u>Yes</u>

**INVASIVENESS RANKING**

	Total (total answered points possible <sup>1</sup> )	Total
Ecological impact	40 (40)	<u>8</u>
Biological characteristics and dispersal ability	25 (25)	<u>12</u>
Ecological amplitude and distribution	25 (25)	<u>14</u>
Feasibility of control	10 (10)	<u>5</u>
Outcome score	100 (100) <sup>b</sup>	<u>39<sup>a</sup></u>
Relative maximum score <sup>2</sup>		<u>39</u>

<sup>1</sup> For questions answered “unknown” do not include point value for the question in parentheses for “total answered points possible.”

<sup>2</sup> Calculated as  $a/b \times 100$

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## A. CLIMATIC COMPARISON

1.1. Has this species ever been collected or documented in Alaska?

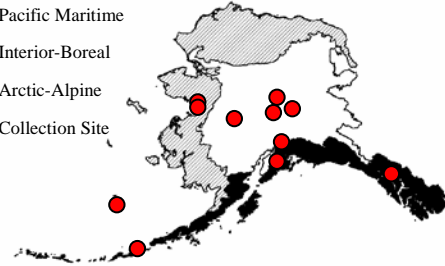
- Yes - continue to 1.2  
 No - continue to 2.1

1.2. From which eco-geographic region has it been collected or documented (see inset map)?

Proceed to Section B. INVASIVENESS RANKING

- Pacific Maritime  
 Interior-Boreal  
 Arctic-Alpine

- Pacific Maritime  
□ Interior-Boreal  
▨ Arctic-Alpine  
● Collection Site



**Documentation:** *Hordeum vulgare* has been documented from all three ecogeographic regions of Alaska (Hultén 1968, DeVelice 2010, AKEPIC 2011, UAM 2011).

2.1. Is there a 40 percent or higher similarity (based on CLIMEX climate matching, see references) between climates where this species currently occurs and:

- a. Juneau (Pacific Maritime region)?  
 Yes – record locations and percent similarity; proceed to Section B.  
 No
- b. Fairbanks (Interior-Boreal region)?  
 Yes – record locations and percent similarity; proceed to Section B.  
 No
- c. Nome (Arctic-Alpine region)?  
 Yes – record locations and percent similarity; proceed to Section B.  
 No

If “No” is answered for all regions; reject species from consideration

**Documentation:**

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## B. INVASIVENESS RANKING

### 1. Ecological Impact

1.1. Impact on Natural Ecosystem Processes

- |    |   |    |
|----|---|----|
| a. | No perceivable impact on ecosystem processes  | 0  |
| b. | Has the potential to influence ecosystem processes to a minor degree (e.g., has a perceivable but mild influence on soil nutrient availability)   | 3  |
| c. | Has the potential to cause significant alteration of ecosystem processes (e.g., increases sedimentation rates along streams or coastlines, degrades habitat important to waterfowl)   | 7  |
| d. | Has the potential to cause major, possibly irreversible, alteration or disruption of ecosystem processes (e.g., the species alters geomorphology, hydrology, or affects fire frequency thereby altering community composition; species fixes substantial levels of nitrogen in the soil making soil unlikely to support certain native plants or more likely to favor non-native species) | 10 |
| e. | Unknown   | U  |

Score 

3
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**Documentation:** *Hordeum vulgare* likely reduces the availability of soil moisture and nutrients (Ogg and Parker 2000). Populations of *Hordeum vulgare* in Alaska are likely to decrease if natural successional processes are allowed to proceed (Flagstad and Cortés-Burns 2010).

*1.2. Impact on Natural Community Structure*

- |    |   |    |
|----|---|----|
| a. | No perceived impact; establishes in an existing layer without influencing its structure   | 0  |
| b. | Has the potential to influence structure in one layer (e.g., changes the density of one layer)  | 3  |
| c. | Has the potential to cause significant impact in at least one layer (e.g., creation of a new layer or elimination of an existing layer) | 7  |
| d. | Likely to cause major alteration of structure (e.g., covers canopy, eliminating most or all lower layers)                               | 10 |
| e. | Unknown   | U  |

Score 

1
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**Documentation:** *Hordeum vulgare* escapes cultivation and grows in roadsides and disturbed areas (Hultén 1968, von Bothmer et al. 2007, Klinkenberg 2010, AKEPIC 2011), where it may increase the density of vegetation. However, because all infestations recorded in Alaska have occurred at only 1% ground cover (AKEPIC 2011), potential impacts are minor.

*1.3. Impact on Natural Community Composition*

- |    |  |    |
|----|--|----|
| a. | No perceived impact; causes no apparent change in native populations   | 0  |
| b. | Has the potential to influence community composition (e.g., reduces the population size of one or more native species in the community)  | 3  |
| c. | Has the potential to significantly alter community composition (e.g., significantly reduces the population size of one or more native species in the community)  | 7  |
| d. | Likely to cause major alteration in community composition (e.g., results in the extirpation of one or more native species, thereby reducing local biodiversity and/or shifting the community composition towards exotic species) | 10 |
| e. | Unknown  | U  |

Score 

1
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**Documentation:** *Hordeum vulgare* may decrease native plant populations in disturbed areas. However, because all infestations recorded in Alaska have occurred at only 1% ground cover (AKEPIC 2011), potential impacts are likely minor.

*1.4. Impact on associated trophic levels (cumulative impact of this species on the animals, fungi, microbes, and other organisms in the community it invades)*

- |    |   |    |
|----|---|----|
| a. | Negligible perceived impact   | 0  |
| b. | Has the potential to cause minor alteration (e.g., causes a minor reduction in nesting or foraging sites)   | 3  |
| c. | Has the potential to cause moderate alteration (e.g., causes a moderate reduction in habitat connectivity, interferes with native pollinators, or introduces injurious components such as spines, toxins) | 7  |
| d. | Likely to cause severe alteration of associated trophic populations (e.g., extirpation or endangerment of an existing native species or population, or  | 10 |

significant reduction in nesting or foraging sites)

e. Unknown

U  
Score 

3
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**Documentation:** *Hordeum vulgare* is consumed by grasshoppers (*Melanoplus sanguinipes*, *M. borealis*, and *Camnula pellucida*) in Alaska (Begna and Fielding 2005). Birds and mammals also feed on this species (OGTR 2008). Disease has not been a significant problem for *Hordeum vulgare* in Alaska in the past, but several pathogens are associated with this species (Quarberg et al. 2009). *Hordeum vulgare* is susceptible to loose smut (*Ustilago tritici*), a fungus that can cause significant reductions in seed yield (Lipps 1996). Feral populations of *Hordeum vulgare* may act as a reservoir for the fungus and transfer it to agricultural crops (Graziano pers. obs.). Pollen of *Hordeum vulgare* may cause allergic reactions in people (OGTR 2008).

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Total Possible 

40
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Total 

8
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## 2. Biological Characteristics and Dispersal Ability

### 2.1. Mode of reproduction

- a. Not aggressive (produces few seeds per plant [0-10/m<sup>2</sup>] and not able to reproduce vegetatively) 0
- b. Somewhat aggressive (reproduces by seed only [11-1,000/m<sup>2</sup>]) 1
- c. Moderately aggressive (reproduces vegetatively and/or by a moderate amount of seed [<1,000/m<sup>2</sup>]) 2
- d. Highly aggressive (extensive vegetative spread and/or many seeded [>1,000/m<sup>2</sup>]) 3
- e. Unknown

U  
Score 

1
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**Documentation:** *Hordeum vulgare* reproduces by seeds. Each spike can produce 15 to 60 seeds, depending on the variety (OGTR 2008).

### 2.2. Innate potential for long-distance dispersal (wind-, water- or animal-dispersal)

- a. Does not occur (no long-distance dispersal mechanisms) 0
- b. Infrequent or inefficient long-distance dispersal (occurs occasionally despite lack of adaptations) 2
- c. Numerous opportunities for long-distance dispersal (species has adaptations such as pappus, hooked fruit coats, etc.) 3
- d. Unknown

U  
Score 

2
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**Documentation:** Seeds are large and heavy and are poorly suited to wind-dispersal. The long awns on the spikelets are densely covered with stiff, straight hairs and can adhere to fur and feathers (von Bothmer et al. 1995).

2.3. Potential to be spread by human activities (both directly and indirectly – possible mechanisms include: commercial sale of species, use as forage or for revegetation, dispersal along highways, transport on boats, common contaminant of landscape materials, etc.).

- |    |  |  |   |
|----|--|--|---|
| a. | Does not occur   | 0  |   |
| b. | Low (human dispersal is infrequent or inefficient)                 | 1  |   |
| c. | Moderate (human dispersal occurs regularly)                        | 2  |   |
| d. | High (there are numerous opportunities for dispersal to new areas) | 3  |   |
| e. | Unknown  | U  |   |
|    |  | Score <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">3</td></tr></table> | 3 |
| 3  |  |  |   |

**Documentation:** *Hordeum vulgare* is the most commonly cultivated cereal crop in Alaska (Quarberg et al. 2009) and occasionally escapes from cultivation (Hultén 1968). It also occurs as a volunteer weed in agricultural fields where it has been previously cultivated (Blackshaw 2005). Seeds have been associated with imported and locally produced straw (Conn et al. 2010, DeVelice 2010). The awns on the spikelets are densely covered with stiff, straight hairs and can adhere to clothing (von Bothmer et al. 1995).

2.4. *Allelopathic*

- |    |         |  |   |
|----|---------|--|---|
| a. | No      | 0  |   |
| b. | Yes     | 2  |   |
| c. | Unknown | U  |   |
|    |         | Score <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">2</td></tr></table> | 2 |
| 2  |         |  |   |

**Documentation:** *Hordeum vulgare* is known to exude allelopathic chemicals, although some cultivars are less allelopathic than others and the allelopathic activity of cultivars in Scandinavia has decreased over the past 100 years (Bertholdsson 2004).

2.5. *Competitive ability*

- |    |   |  |   |
|----|---|--|---|
| a. | Poor competitor for limiting factors                                | 0  |   |
| b. | Moderately competitive for limiting factors                         | 1  |   |
| c. | Highly competitive for limiting factors and/or able to fix nitrogen | 3  |   |
| d. | Unknown   | U  |   |
|    |   | Score <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">1</td></tr></table> | 1 |
| 1  |   |  |   |

**Documentation:** *Hordeum vulgare* is more competitive than most cereal crops with weed species in agricultural fields (OGTR 2008).

2.6. *Forms dense thickets, has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation.*

- |    |   |  |   |
|----|---|--|---|
| a. | Does not grow densely or above surrounding vegetation   | 0  |   |
| b. | Forms dense thickets  | 1  |   |
| c. | Has a climbing or smothering growth habit, or is otherwise taller than the surrounding vegetation | 2  |   |
| d. | Unknown   | U  |   |
|    |   | Score <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">0</td></tr></table> | 0 |
| 0  |   |  |   |

**Documentation:** *Hordeum vulgare* does not form dense thickets or significantly overtop surrounding vegetation (von Bothmer et al. 2007, Klinkenberg 2010).

2.7. *Germination requirements*

- |    |  |   |
|----|--|---|
| a. | Requires sparsely vegetated soil and disturbance to germinate            | 0 |
| b. | Can germinate in vegetated areas, but in a narrow range of or in special | 2 |

- conditions
  - c. Can germinate in existing vegetation in a wide range of conditions 3
  - d. Unknown U
- Score 0

**Documentation:** *Hordeum vulgare* grows in agricultural fields, roadsides, and anthropogenically disturbed areas in North America (von Bothmer et al. 2007, Klinkenberg 2010, AKEPIC 2011).

2.8. Other species in the genus invasive in Alaska or elsewhere

- a. No 0
  - b. Yes 3
  - c. Unknown U
- Score 3

**Documentation:** *Hordeum jubatum* is considered a noxious weed in Manitoba and Quebec (Invaders 2011). Although the native status of *H. jubatum* is disputed in Alaska, it is considered a nuisance weed with an invasiveness rank of 63. *H. murinum* ssp. *leporinum* is known to occur as a non-native weed in Alaska with an invasiveness ranking of 60 (AKEPIC 2011).

2.9. Aquatic, wetland, or riparian species

- a. Not invasive in wetland communities 0
  - b. Invasive in riparian communities 1
  - c. Invasive in wetland communities 3
  - d. Unknown U
- Score 0

**Documentation:** *Hordeum vulgare* is not known to invade riparian or wetland communities.

Total Possible	25
Total	12

### 3. Ecological Amplitude and Distribution

3.1. Is the species highly domesticated or a weed of agriculture?

- a. Is not associated with agriculture 0
  - b. Is occasionally an agricultural pest 2
  - c. Has been grown deliberately, bred, or is known as a significant agricultural pest 4
  - d. Unknown U
- Score 4

**Documentation:** *Hordeum vulgare* is commonly cultivated throughout the temperate regions of the world (von Bothmer et al. 2007, eFloras 2008, Gashkova 2009), including Alaska (Quarberg et al. 2009). It can occur as a volunteer weed in agricultural fields where it has been previously cultivated (Blackshaw 2005).

3.2. Known level of ecological impact in natural areas

- a. Not known to impact other natural areas 0
- b. Known to impact other natural areas, but in habitats and climate zones dissimilar to those in Alaska 1

- c. Known to cause low impact in natural areas in habitats and climate zones similar to those in Alaska 3
  - d. Known to cause moderate impact in natural areas in habitat and climate zones similar to those in Alaska 4
  - e. Known to cause high impact in natural areas in habitat and climate zones similar to those in Alaska 6
  - f. Unknown U
- Score 0

**Documentation:** No impacts have been documented from natural areas.

3.3. *Role of anthropogenic and natural disturbance in establishment*

- a. Requires anthropogenic disturbance to establish 0
  - b. May occasionally establish in undisturbed areas, readily establishes in naturally disturbed areas 3
  - c. Can establish independently of natural or anthropogenic disturbances 5
  - e. Unknown U
- Score 0

**Documentation:** *Hordeum vulgare* grows in agricultural fields, roadsides, and anthropogenically disturbed areas in North America (von Bothmer et al. 2007, Klinkenberg 2010, AKEPIC 2011).

3.4. *Current global distribution*

- a. Occurs in one or two continents or regions (e.g., Mediterranean region) 0
  - b. Extends over three or more continents 3
  - c. Extends over three or more continents, including successful introductions in arctic or subarctic regions 5
  - e. Unknown U
- Score 5

**Documentation:** *Hordeum vulgare* was first cultivated in western Asia and is currently cultivated throughout most of the world (von Bothmer et al. 2007). It grows north of the Arctic Circle in Scandinavia, Siberia, and Yakutia (Gashkova 2009).

3.5. *Extent of the species' U.S. range and/or occurrence of formal state or provincial listing*

- a. Occurs in 0-5 percent of the states 0
  - b. Occurs in 6-20 percent of the states 2
  - c. Occurs in 21-50 percent of the states and/or listed as a problem weed (e.g., "Noxious," or "Invasive") in one state or Canadian province 4
  - d. Occurs in more than 50 percent of the states and/or listed as a problem weed in two or more states or Canadian provinces 5
  - e. Unknown U
- Score 5

**Documentation:** *Hordeum vulgare* grows in 48 states of the U.S. and most of Canada (von Bothmer et al. 2007, USDA 2011). It is not considered a noxious weed in any states of the U.S. or provinces of Canada.

Total 

14
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#### 4. Feasibility of Control

##### 4.1. Seed banks

- a. Seeds remain viable in the soil for less than three years 0
- b. Seeds remain viable in the soil for three to five years 2
- c. Seeds remain viable in the soil for five years or longer 3
- e. Unknown U

Score 

2
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**Documentation:** The amount of time seeds remain viable in the soil is unknown; however, volunteer populations in Scotland persisted for up to five years in agricultural fields (OGTR 2008).

##### 4.2. Vegetative regeneration

- a. No resprouting following removal of aboveground growth 0
- b. Resprouting from ground-level meristems 1
- c. Resprouting from extensive underground system 2
- d. Any plant part is a viable propagule 3
- e. Unknown U

Score 

1
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**Documentation:** As a grass, *Hordeum vulgare* resprouts from ground-level meristems after the removal of the above-ground portions.

##### 4.3. Level of effort required

- a. Management is not required (e.g., species does not persist in the absence of repeated anthropogenic disturbance) 0
- b. Management is relatively easy and inexpensive; requires a minor investment of human and financial resources 2
- c. Management requires a major short-term or moderate long-term investment of human and financial resources 3
- d. Management requires a major, long-term investment of human and financial resources 4
- e. Unknown U

Score 

2
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**Documentation:** Populations in Alaska are likely to decrease if natural successional processes are allowed to proceed (Flagstad and Cortés-Burns 2010). Mechanical methods likely control small populations of *Hordeum vulgare* effectively because it is an annual grass. *Hordeum vulgare* can be controlled with applications of glyphosate, sulfosulfuron, and imidazolinone (Ogg and Parker 2000, O'Donovan et al. 2007). Sethoxydim and fluazifop can control this species without harming broadleaf vegetation (Ogg and Parker 2000).

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Total Possible 

10
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Total 

5
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Total for four sections possible 

100
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**References:**

- AKEPIC database. Alaska Exotic Plant Information Clearinghouse Database. 2011. Available: <http://akweeds.uaa.alaska.edu/>
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